Wisconsin Valley Improvement Company

Purple Loosestrife Annual Monitoring Report – 2013

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Five-Year Summary and Proposed Purple Loosestrife Monitoring Plan

November 27, 2013

Introduction

In compliance with Wisconsin Valley Improvement Company's (WVIC) 1996 FERC license (Project No. 2113), the purple loosestrife control program became a part of WVIC's FERC approved 1997 Fish and Wildlife Management Plan (Article 413). The Fish and Wildlife Management Plan was updated in 2001, 2006 and 2011 in accordance with a five-year update requirement in WVIC's FERC license. WVIC drafted a Modified Purple Loosestrife Control Plan in November 2008. The purpose of the Modified Plan was to terminate and/or phase out chemical control of loosestrife and implement biological control with *Galerucella sp.* beetles. The Plan was sent to Wisconsin DNR (WDNR) and US Fish and Wildlife Service (USFWS) for review and comment. Comments were received from WDNR and incorporated into the Plan. The Plan was sent to FERC November 26, 2008 as an amendment request to WVIC's Fish and Wildlife Management Plan. FERC issued an Order Amending the Plan June 16, 2009 and approved the Plan with minor reporting modifications.

This report represents the fifth in a series of five annual Purple Loosestrife Monitoring Reports and includes proposals for future monitoring and management as required in the June 16, 2009 FERC Order.

2013 Field Monitoring Results

Willow Reservoir – On August 7, 2013 WVIC monitored the area of Willow Reservoir where loosestrife has historically occurred. Reservoir elevation was 1525.12 ft NGVD (4.23 ft. below full). The area was accessed by boat and then surveyed by walking the islands and exposed shoreline and counting both immature and mature plants. GPS readings were taken every 100 ft where plants were observed. Loosestrife relative abundance was recorded as A (1-5 plants), B (6-50 plants), or C (50+ plants). Figure 1 is a distribution and relative abundance map of recorded locations in 2013 and Table 1 lists GPS coordinates for each observation.

Distribution of loosestrife in 2013 was limited to the general area of small islands in the southeastern most portion of the reservoir where loosestrife was first observed in 1997 and has been observed annually since. In addition to the islands several small beds were observed in 2012 on the adjacent shoreline where loosestrife had not been observed since 2008. The six shoreline beds discovered in 2012 declined to only three beds in 2013. After an overall increase in 2012, relative abundance of loosestrife beds with 1--5 plants and dense beds with 50+ plants decreased in 2013 and beds with 6-50 plants remained the same. The number of beds observed with 1-5 plants decreased from nine beds in 2012 to only four beds in 2013. No beds with 50+ plants were identified in 2013 compared to 2012 when one bed was observed. The general decrease in loosestrife abundance and distribution in 2013 could be attributed to higher water levels during the growing season and near record ice-off dates that resulted in a later and cooler spring. Loosestrife was not observed outside of its historic range at Willow.

Galerucella sp. beetles have not been observed at Willow Reservoir to date although they are present in the Tripoli area to the southwest, Rice Reservoir to the southeast and the Minocqua Reservoir system to the

northeast, all within 10-12 miles of Willow. It is unlikely that the low relative abundance of loosestrife would support a sustained beetle population.

Rice Reservoir – On August 6-8, 2013 WVIC monitored the portions of Rice Reservoir where loosestrife has historically occurred. Reservoir elevation was 1460.39 ft NGVD (2.86ft below full) during the monitoring period. The general areas were accessed by boat and by walking the exposed shoreline and counting both immature and mature plants.

Relative abundance and distribution of loosestrife and *Galerucella sp*. beetle distribution was recorded with GPS. Figure 2 is a distribution map of recorded loosestrife and beetle activity locations in 2013 and Table 2 lists GPS coordinates for each observation. Relative abundance declined with 103 beds observed in 2012 and only 98 beds in 2013. Dense loosestrife beds of 50+ plants increased from 16 beds in 2012 to 17 beds (50+ plants) in 2013. The greatest decrease in relative abundance was loosestrife beds with 6-50 plants from 51 beds in 2012 to 42 beds (6-50 plants) in 2013. Beds with 1-5 plants increased from 36 beds in 2012 to 39 beds (1-5 plants) in 2013. The general decrease in loosestrife abundance and distribution in 2013 could be attributed to an increased number of sites with beetle activity discussed below in conjunction with higher water levels during the growing season and near record ice-off dates. Loosestrife was not observed outside of its historic range at Rice.

Galerucella sp. beetle activity increased from 13 beds in 2012 to 18 loosestrife beds in 2013. The number of beds with observed beetles has increased annually since first being confirmed in only two beds at Rice Reservoir in 2009. All observations in the eighteen beds were adult beetles. Significant leaf and stem damage characteristic of *Galerucella sp*. beetles was also observed in each of the beds. Nine of the dense beds of 50+ plants are now inhabited by beetles. The remaining eight beds with beetles present contain 6-50 plants and are in close proximity to dense beds. This is only the fifth year beetles have inhabited Rice Reservoir, and they've already expanded to six separate areas within the reservoir (Figure 2). Continued monitoring will determine their ultimate effectiveness but they have exhibited an ability to expand naturally.

Timed Beetle Counts - During the 2013 monitoring period, WVIC tested a Timed Beetle Count as a method of acquiring additional quantitative data on beetle populations. The beetle counts were conducted at each of the 50+ plant beds beetles were observed in and lasted three minutes per site. Once the three minute count began, plants within the bed boundary were inspected for beetles in both adult and larval stage. Plants were not touched and care was given to avoid brushing up against plants during the count since we have observed beetles falling from plants after being disturbed during previous walk-throughs. After the three minute count was complete, the totals were recorded in the comments section of the GPS for the bed surveyed. Results from the beetle counts are displayed in Table 2.

After attempting a timed beetle count at a less dense bed with 6-50 plants, it was determined in the field that too much time was spent trying to locate individual loosestrife plants and walking from plant to plant during the timed counts. The variability in spacing amongst individual plants within a low to moderate density bed meant the total number of beetles observed would be biased based on the proximity and arrangement of plants within a given bed. As a result, only dense beds with 50+ plants were utilized for the timed counts in 2013 because the density and number of plants ensured all time was being utilized for beetle searching oppose to walking and looking for plants. A simple solution to the aforementioned issue involves using a stop watch (which was unavailable at the time of the surveys) to ensure the three minute count only consists of time actively looking for beetles and does not include the time walking between plants. This technique is proposed and discussed later in the future monitoring plan.

Spirit Reservoir – On August 6, 2013 WVIC monitored the portion of Spirit Reservoir where loosestrife has historically occurred. Reservoir elevation was 1434.67 ft. NGVD (3.21 ft below full). The general areas were accessed by boat and by walking the exposed shoreline/causeway and counting both immature and mature

plants. Relative abundance and distribution of loosestrife was recorded with GPS. No *Galerucella sp*. beetles were observed in 2013. Figure 3 is a distribution map of recorded loosestrife locations in 2013 and Table 3 lists GPS coordinates for each observation.

Distribution of loosestrife in 2013 (Figure 3) remained confined to the Highway 86 bay and similar to previous years. Overall relative abundance of beds declined from 23 beds in 2012 to 15 beds in 2013. Relative abundance of dense loosestrife beds (50+ plants) also declined from 2 beds in 2012, back to 1 dense bed in 2013, which is similar to 2009-2011. Similar to the other reservoirs, the higher water levels during the growing season and late ice-out may have attributed to the decreased number of loosestrife plants observed in 2012. Loosestrife was not observed outside of its historic range at Spirit.

Galerucella sp. beetles were not observed in 2013. The same area on Spirit where beetles were previously observed in 2009-2011 was chemically treated by a private landowner in 2012. No beetles The lack of beetles could be related to the spraying or the decline in relative abundance and high density beds of 50+ plants. Despite the lack of beetle activity relative abundance declined.

Five-Year Summary and Proposed Purple Loosestrife Monitoring Plan

After an initial increase in relative abundance at all three reservoirs from 2009 to 2010, relative abundance declined significantly in 2011 to the lowest observed levels of the 5-year monitoring period. The relative abundance then rebounded in 2012 and increased to similar levels as found in 2010. Results from 2013 monitoring indicate a general decrease in relative abundance of purple loosestrife at Willow, Rice and Spirit reservoirs compared to 2012. Graphs depicting population changes at each of the reservoirs between 2009-2013 can be found in Figures 4-6. Note: Willow Reservoir monitoring data was not collected in 2009 because low water levels prevented access to the purple loosestrife areas by boat and reservoir bottom conditions were unsafe for travel by foot.

What is not depicted in graphs are the underlying factors influencing the relative abundance data. In back to back years, we observed one of the earliest ice-out dates in 2012 which was followed by one of the latest ice-out dates in 2013. Spring reservoir refill rates and water elevations throughout the open water season fluctuate from year to year. Growing conditions like temperature, precipitation, and wind during at varying times of the season have unrecorded influence on plant vigor, seed development and germination rates. Competition from native plant communities and stress from biological controls like beetles add another level of stress and influence on populations. WVIC's monitoring results from the last five years are a reflection of the multitude of these aforementioned variables that can work independently or in conjunction with each other from year to year to alter relative abundance of purple loosestrife.

Rice Reservoir - Despite the fluctuations in purple loosestrife populations, WVIC tracked a steady increase in the number of sites where beetles were observed indicating an expanding beetle population on Rice Reservoir. In 2009 there were two observed beetle locations and by 2013, eighteen beetle sites were identified (Figure 7). This expansion of beetles may represent a population that is not at carrying capacity yet and bodes well for biological control of purple loosestrife in the coming years. Based on the natural expansion of the beetle population at Rice Reservoir, introductions of additional beetles are not proposed at this time. With continued monitoring of the beetle populations and the newly tested and proposed timed beetle counts, we'll be able to get a better understanding of changes in beetle populations from year to year and the effects their populations have on purple loosestrife abundance. The quantitative beetle monitoring will be used with purple loosestrife abundance data to assess whether additional beetle introductions need to be considered in the future.

Spirit & Willow Reservoirs- While beetle populations did not become established at Willow or Spirit Reservoirs, the purple loosestrife populations did not expanded beyond historic ranges at either reservoir and relative abundance is declining at both. Despite fluctuations from year to year, the 2013 monitoring results show the second lowest relative abundance levels of purple loosestrife since chemical spraying was discontinued on these reservoirs. The current decline from 2012-2013 and low relative abundance of loosestrife at both Spirit and Willow Reservoirs are unlikely to support a sustained beetle population. Providing loosestrife populations continue to remain near the levels observed over the last five years, beetle introduction at these sites is not being proposed at this time. If purple loosestrife populations expand in the future, potential beetle releases can be discussed during the annual review and comment period with the agencies.

Proposed Monitoring and Management Methods

WVIC proposes to continue biological control management and monitoring of purple loosestrife populations and add an additional component to quantitatively monitor beetle populations. Annual monitoring surveys at the three reservoirs (Willow, Rice and Spirit) will be conducted where purple loosestrife has historically occurred during late-July or early-August to document loosestrife distribution and abundance along with documenting any continued immigration and distribution of *Galerucella sp*.

beetles. Where purple loosestrife has not historically occurred, WVIC will continue to rely on the agencies and public's assistance with reporting newly established plant locations. WVIC maintains purple loosestrife information posters at its boat landings asking the public to report any sightings of loosestrife and all reports are followed up with field inspections.

The historical monitoring areas will be accessed by boat and then surveyed by walking the exposed shorelines to count both immature and mature plants. GPS readings will be taken every 100 ft. where plants were observed. Loosestrife relative abundance will be recorded as A (1-5 plants), B (6-50 plants), or C (50+ plants). WVIC will incorporate timed beetle counts at all beds where beetles are observed. The timed beetle counts are being added to the existing monitoring protocol to provide a quantitative component to assist in making future management decisions. Timed beetle counts will be conducted as follows.

Timed Beetle Counts- When beetles, larvae, or eggs are identified during monitoring, WVIC will determine which abundance category the purple loosestrife bed falls into (1-5 plants, 6-50, or 50+) and visually determine the edge of the bed to ensure beetles are not counted within adjacent beds. The timed count will last three minutes per bed and only include the time actively looking for beetles on plants. The three minute time period will not include the time spent walking between plants within the bed to avoid unreliable beetle counts from year to year which could be influenced by plant density and distribution. This method can best be accomplished by using a stop watch. Once positioned in front of a plant the watch can be started and the clock remains running until the counter needs to reposition to another plant. In dense beds there may be very little starting and stopping of the clock because the counter can continually inspect and count beetles from one plant to the next without having to cover areas where purple loosestrife is not present. However, in less dense beds with 6-50 plants, the clock will likely have to be stopped more often to find and walk to the next plant to survey. This process should be repeated until 3 minutes of actively counting beetles has elapsed. The total number of beetles will be entered into the comments section of the GPS for the corresponding bed and included in report tables.

Reporting

WVIC will submit an annual report including maps depicting relative abundance of purple loosestrife and beetle activity along with correlating tables to WDNR and USFWS for review and consultation in the fall of each year. The report will include monitoring data and gps locationsof purple loosestrife abundance and beetle populations on Willow, Rice, and Spirit including proposals for future monitoring and management options. After agency consultation, WVIC will submit a finalized annual report and consultation documentation to FERC by December 31st of each year.

Figure 1

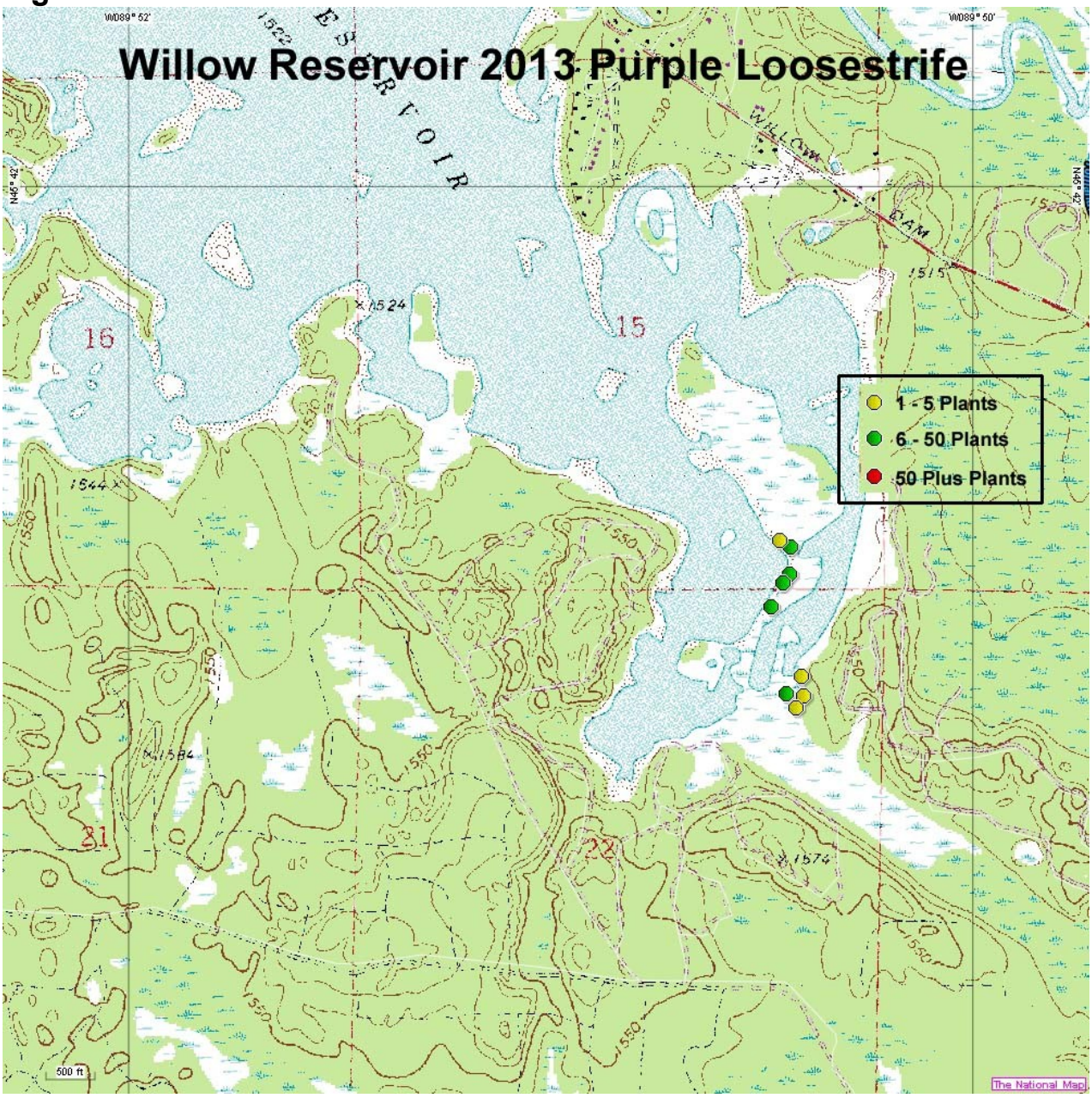

Willow Reservoir 2013 Purple Loosestrife
1 - 5 Plants
6 - 50 Plants
50 Plus Plants
16
15
21
22
1524
1544
1574
1584
1550
1540
1530
1520
1515
WILLOW
DAM
500 ft
The National Map

Table 1

Purple Loosestrife Survey - 2013						
Willow Reservoir						
Number	**Latitude**		**Longitude**		**Amount**	**Beetle Activity**
1	45	41.41159	-89	50.45652	1-5 plants	no
2	45	41.39956	-89	50.43089	6-50 plants	no
3	45	41.35425	-89	50.43436	6-50 plants	no
4	45	41.34072	-89	50.44911	6-50 plants	no
5	45	41.30135	-89	50.47594	6-50 plants	no
6	45	41.18581	-89	50.40503	1-5 plants	no
7	45	41.15722	-89	50.44154	6-50 plants	no
8	45	41.15351	-89	50.40062	1-5 plants	no
9	45	41.13237	-89	50.41843	1-5 plants	no

Figure 2

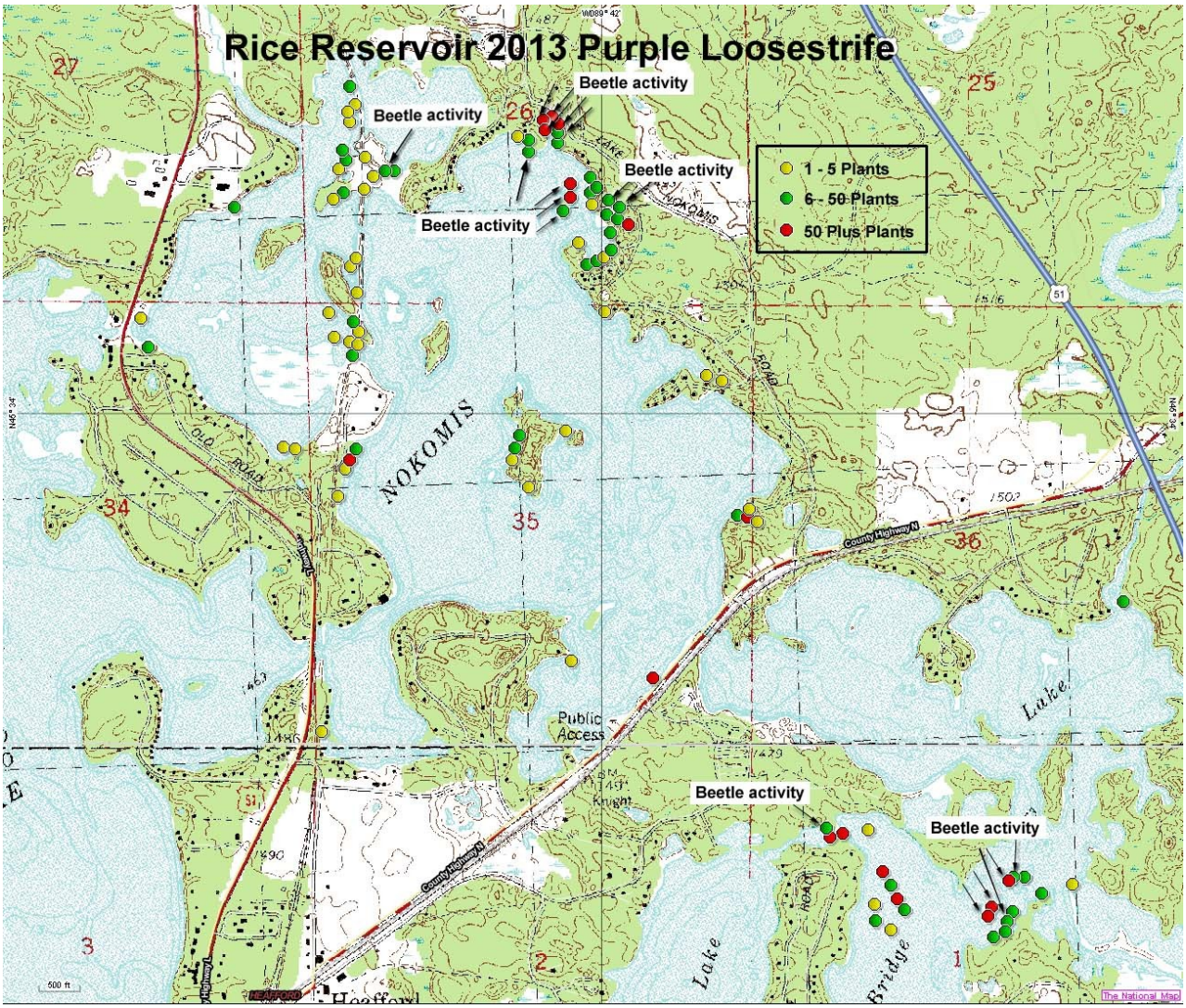

Rice Reservoir 2013 Purple Loosestrife
Beetle activity
Beetle activity
Beetle activity
Beetle activity
Beetle activity
Beetle activity
1 - 5 Plants
6 - 50 Plants
50 Plus Plants
NOKOMIS
Old Road
County Highway N
Public Access
Lake
Bridge
ROAD
27
26
25
34
35
36
3
2
1
51

Table 2

Purple Loosestrife Survey - 2013

Rice Reservoir

Number	Latitude		Longitude		Amount	Beetle Activity	Timed Count
1	45	33.83403	-89	42.74529	1-5 plants		
2	45	34.13521	-89	42.68847	1-5 plants		
3	45	34.16148	-89	42.68712	1-5 plants		
4	45	34.18112	-89	42.70191	6-50 plants		
5	45	34.23969	-89	42.69110	1-5 plants		
6	45	34.29162	-89	42.71011	1-5 plants		
7	45	34.30837	-89	42.69316	1-5 plants		
8	45	34.43817	-89	42.72913	6-50 plants		
9	45	34.42518	-89	42.75807	1-5 plants		
10	45	33.47325	-89	41.85377	50+ plants		
11	45	34.48454	-89	42.74250	1-5 plants		
12	45	33.62454	-89	40.52323	6-50 plants		
13	45	34.50159	-89	42.72136	6-50 plants		
14	45	33.06402	-89	40.66769	1-5 Plants		
15	45	34.52239	-89	42.73168	6-50 plants		
16	45	33.04680	-89	40.75343	6-50 plants		
17	45	34.57886	-89	42.71052	1-5 plants		
18	45	34.59856	-89	42.71790	1-5 plants		
19	45	33.01083	-89	40.83749	6-50 plants		
20	45	34.40775	-89	43.03762	6-50 plants		
21	45	32.99016	-89	40.85264	6-50 plants	yes	
22	45	34.18795	-89	43.30280	1-5 plants		
23	45	34.13028	-89	43.28184	6-50 plants		
24	45	33.07861	-89	40.80288	6-50 plants		
25	45	33.93199	-89	42.89819	1-5 plants		
26	45	33.07926	-89	40.83362	6-50 plants	yes	
27	45	33.92931	-89	42.86681	1-5 plants		
28	45	33.07105	-89	40.84534	50+ plants	yes	54
29	45	34.15030	-89	42.75475	1-5 plants		
30	45	33.01988	-89	40.89423	50+ plants	yes	32
31	45	34.19978	-89	42.77109	1-5 plants		
32	45	33.00070	-89	40.90623	50+ plants	yes	16
33	45	33.36780	-89	42.79143	1-5 plants		
34	45	32.95895	-89	40.88959	6-50 plants		
35	45	34.30901	-89	41.99152	1-5 plants		

Table 2 (cont.)

Purple Loosestrife Survey - 2013

Rice Reservoir

Number	Latitude		Longitude		Amount	Beetle Activity	Timed Count
36	45	32.96955	-89	40.85652	6-50 plants		
37	45	34.32373	-89	41.97289	6-50 plants		
38	45	32.97465	-89	41.18149	1-5 plants		
39	45	32.99212	-89	41.22512	6-50 plants		
40	45	34.35777	-89	41.97366	6-50 plants		
41	45	33.02459	-89	41.22626	1-5 plants		
42	45	34.41340	-89	42.02462	1-5 plants		
43	45	33.17247	-89	41.24485	1-5 plants		
44	45	34.44880	-89	42.01302	6-50 plants		
45	45	33.16464	-89	41.31598	50+ plants		
46	45	34.40118	-89	42.10737	6-50 plants	yes	
47	45	33.15785	-89	41.35282	50+ plants		
48	45	34.48154	-89	42.612109	6-50 plants	yes	
49	45	33.17581	-89	41.363409	6-50 plants	yes	
50	45	34.44452	-89	42.670131	1-5 plants		
51	45	33.08976	-89	41.204056	50+ plants		
52	45	33.06275	-89	41.179694	6-50 plants		
53	45	33.03453	-89	41.163893	50+ plants		
54	45	33.01270	-89	41.141755	6-50 plants		
55	45	33.50731	-89	42.08584	1-5 plants		
56	45	33.88823	-89	42.723586	1-5 plants		
57	45	33.90670	-89	42.710495	50+ plants		
58	45	33.92930	-89	42.693617	6-50 plants		
59	45	34.14206	-89	42.712039	1-5 plants		
60	45	33.79637	-89	41.615922	6-50 plants		
61	45	33.79323	-89	41.586366	50+ plants		
62	45	33.78356	-89	41.559148	1-5 plants		
63	45	33.80931	-89	41.580788	1-5 plants		
64	45	34.07480	-89	41.702483	1-5 plants		
65	45	34.06402	-89	41.658247	1-5 plants		
66	45	34.20088	-89	41.990684	1-5 plants		
67	45	34.33750	-89	42.064154	1-5 plants		
68	45	34.29470	-89	42.041257	6-50 plants		
69	45	34.30175	-89	42.013838	6-50 plants		
70	45	34.39361	-89	41.984679	6-50 plants		

Table 2 (cont.)

Purple Loosestrife Survey - 2013

Rice Reservoir

Number	Latitude		Longitude		Amount	Beetle Activity	Timed Count
71	45	34.38471	-89	41.952744	6-50 plants		
72	45	34.37508	-89	41.923213	50+ plants		
73	45	34.40871	-89	41.949872	6-50 plants	yes	
74	45	34.42242	-89	41.978996	6-50 plants	yes	
75	45	34.43712	-89	42.03154	6-50 plants		
76	45	34.46778	-89	42.031369	6-50 plants		
77	45	34.53596	-89	42.123156	6-50 plants		
78	45	34.55734	-89	42.124424	6-50 plants		
79	45	34.57476	-89	42.120928	50+ plants	yes	12
80	45	34.58853	-89	42.139883	50+ plants	yes	12
81	45	34.58240	-89	42.164053	50+ plants	yes	26
82	45	34.56111	-89	42.160397	50+ plants	yes	54
83	45	34.42921	-89	42.088561	50+ plants	yes	18
84	45	34.45608	-89	42.088465	50+ plants	yes	29
85	45	34.51815	-89	42.205257	6-50 plants	yes	
86	45	34.54211	-89	42.206243	6-50 plants		
87	45	34.54995	-89	42.235844	1-5 plants		
88	45	34.47986	-89	42.586768	6-50 plants		
89	45	34.46910	-89	42.644472	1-5 plants		
90	45	34.50757	-89	42.666973	1-5 plants		
91	45	34.64804	-89	42.712154	6-50 plants		
92	45	34.61244	-89	42.697062	1-5 plants		
93	45	33.90752	-89	42.253079	1-5 plants		
94	45	33.92995	-89	42.244243	6-50 plants		
95	45	33.95570	-89	42.231766	6-50 plants		
96	45	33.85343	-89	42.205855	1-5 plants		
97	45	33.96431	-89	42.101355	1-5 plants		
98	45	34.11531	-89	42.7037	6-50 plants		

Figure 3

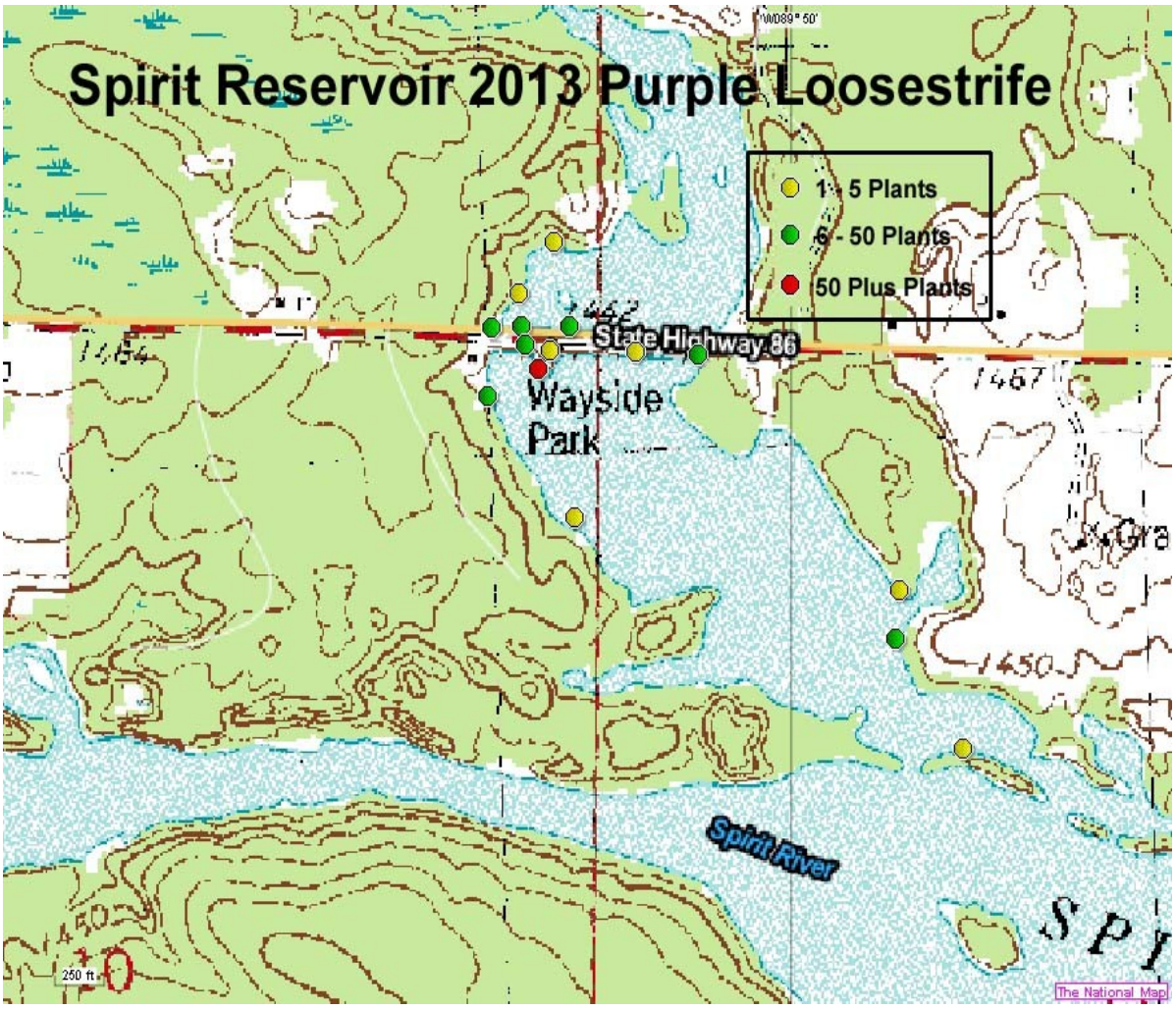

Spirit Reservoir 2013 Purple Loosestrife
1 - 5 Plants
6 - 50 Plants
50 Plus Plants
State Highway 86
Wayside Park
Spirit River
1450
1467
250 ft
The National Map

Table 3

Purple Loosestrife Survey - 2013

Spirit Reservoir

Number	Latitude		Longitude		Amount	Beetle Activity
1	45	27.26322	-89	50.18289	1-5 plants	no
2	45	27.26064	-89	50.10986	6-50 plants	no
3	45	27.28127	-89	50.26853	6-50 plants	no
4	45	27.28321	-89	50.31859	6-50 plants	no
5	45	27.28170	-89	50.32042	1-5 plants	no
6	45	27.28169	-89	50.35333	6-50 plants	no
7	45	27.34596	-89	50.27999	1-5 plants	no
8	45	27.08293	-89	49.87151	1-5 plants	no
9	45	27.04673	-89	49.87619	6-50 plants	no
10	45	26.96301	-89	49.79647	1-5 plants	no
11	45	27.13819	-89	50.25518	1-5 plants	no
12	45	27.22941	-89	50.35733	6-50 plants	no
13	45	27.26886	-89	50.31394	6-50 plants	no
14	45	27.26436	-89	50.28501	1-5 plants	no
15	45	27.25004	-89	50.29881	50+ plants	no

Figure 4

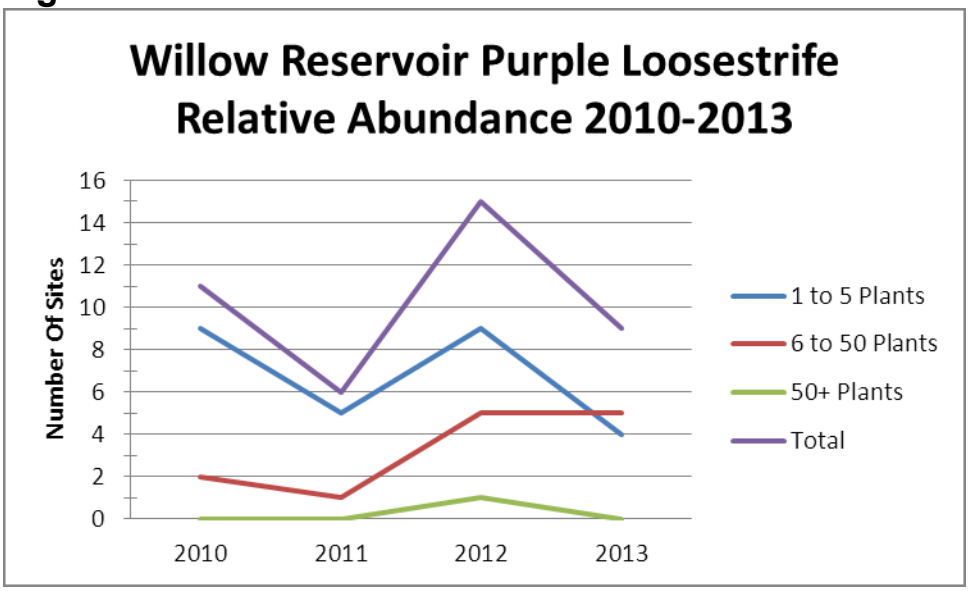

Willow Reservoir Purple Loosestrife
Relative Abundance 2010-2013
Number Of Sites
16
14
12
10
8
6
4
2
0
2010
2011
2012
2013
1 to 5 Plants
6 to 50 Plants
50+ Plants
Total

Figure 5

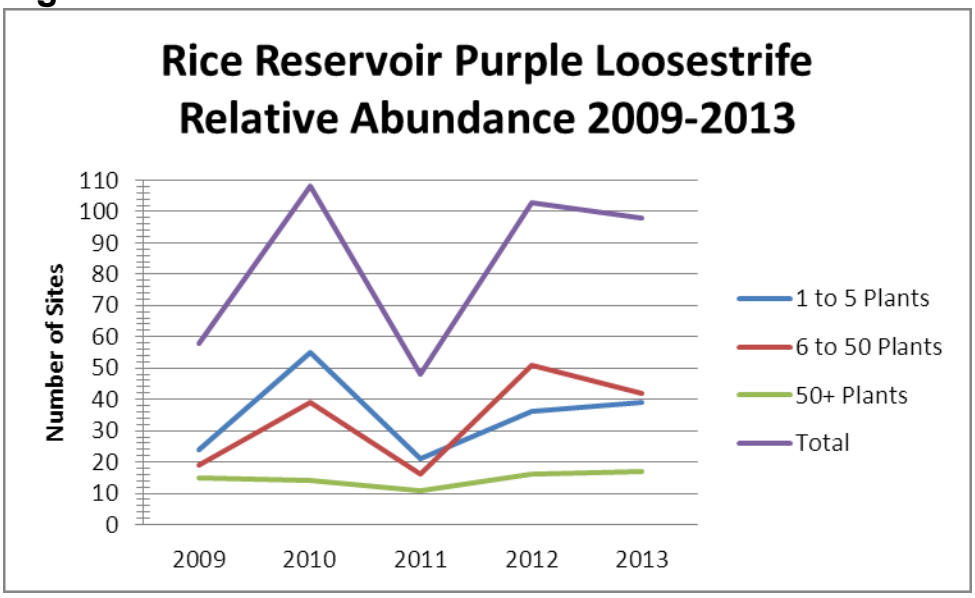

Rice Reservoir Purple Loosestrife
Relative Abundance 2009-2013
Number of Sites
110
100
90
80
70
60
50
40
30
20
10
0
2009
2010
2011
2012
2013
1 to 5 Plants
6 to 50 Plants
50+ Plants
Total

Figure 6

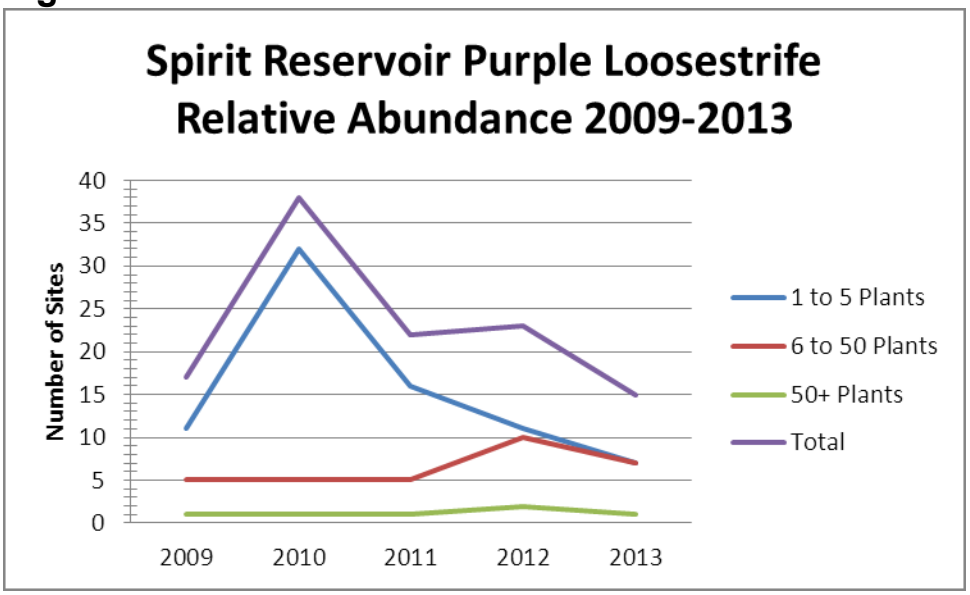
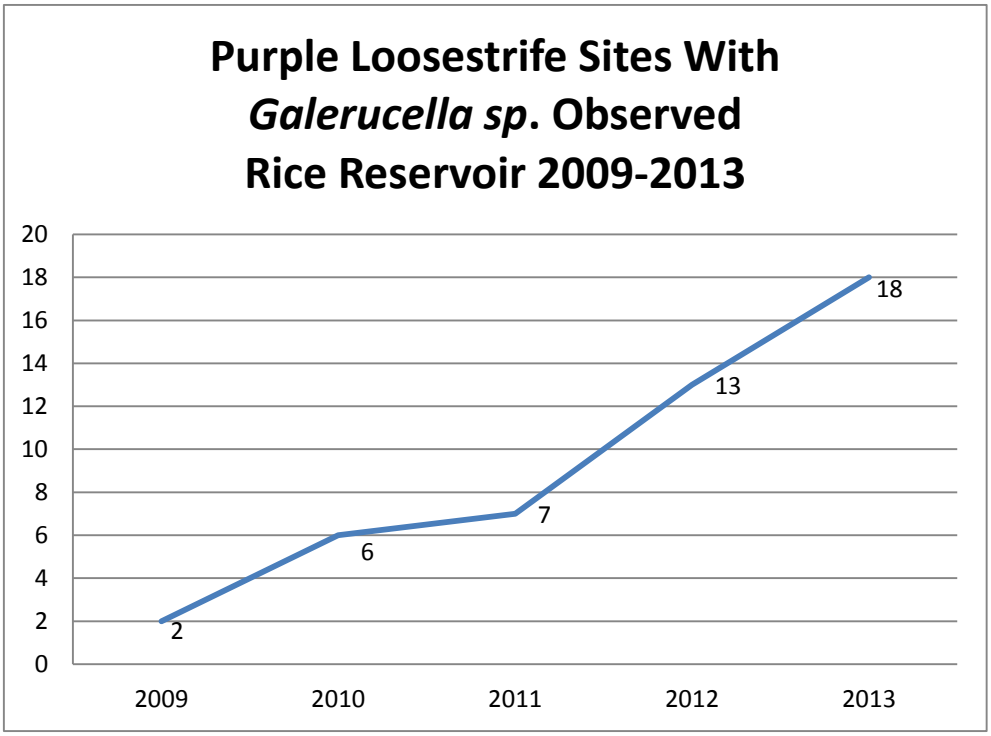

Spirit Reservoir Purple Loosestrife
Relative Abundance 2009-2013
Number of Sites
40
35
30
25
20
15
10
5
0
2009
2010
2011
2012
2013
1 to 5 Plants
6 to 50 Plants
50+ Plants
Total

Figure 7


Purple Loosestrife Sites With
Galerucella sp. Observed
Rice Reservoir 2009-2013
20
18
16
14
12
10
8
6
4
2
0
2
6
7
13
18
2009
2010
2011
2012
2013